

REMARKS

The Office Action mailed October 12, 2001, has been carefully reviewed and considered. Claims 1-8 were pending in the present application. By way of this amendment and reply, claims 3 and 6 have been amended. No new matter has been introduced. Accordingly, claims 1-8 are pending for consideration.

Applicant acknowledges with appreciation the indication in the Office Action that claims 3 and 6 contain allowable subject matter. Claim 3 had been rewritten in independent form. Claim 6 has been amended to correct a typographical error, support for such amendment being found in the specification at page 16, line 18. Accordingly, at least claims 3 and 6 are in condition for allowance.

In the Office Action, claims 1 and 5 were provisionally rejected for obviousness type double patenting over copending application 09/727,789. Submitted concurrently herewith is a terminal disclaimer in compliance with 37 CFR 1.321(c). Accordingly, the non-statutory double patenting rejection is believed to be overcome.

Also in the Office Action, claims 1, 2 and 5 were rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Havstad et al. (U.S. Patent No. 5,224,460). In addition, claims 4, 7 and 8 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the same reference in view of Atago (U.S. Patent No. 6,286,478). For at least the reasons set forth herein, these rejections are respectfully overcome.

Each of the independent claims 1, 5, 7 and 8 recite, in some form, providing a response adjustment to variable valve timing control. Applicant believes this is not disclosed, taught or suggested by Havstad et al. In column 7, lines 33-36 of the reference, phase shifting means is described, which varies the opening and closing of the valves from a *fixed* timing schedule as a function of operating conditions. It does not describe providing a response adjustment to *variable* valve timing control of intake valve for unthrottled intake air control.

To illustrate the significance of this distinction, consider the situation where there is a torque request by a driver requiring an increase in air mass charge. Without the response adjustment of the claimed invention, the opening and closing of the intake valve shifts too quickly. With the claimed response adjustment, the opening and closing

of the intake valve shifts after an appropriate delay from the beginning of such a torque request. There is a predetermined schedule or relationship between the air mass charge and the torque request. This relationship is unaltered with the claimed response adjustment. In Havstad et al., however, it is clearly stated that the opening and closing of the valves are varied from a fixed timing schedule.

The remaining claims in the rejection depend from claim 1 and are therefore also believed to be patentable for at least the reasons set forth above. Accordingly, Applicant requests reconsideration and withdrawal of the rejections under 35 U.S.C. §§ 102 and 103, both of which are based on the Havstad et al. reference.

Applicant respectfully submits that the claims are now in condition for allowance and solicits early notification of the same. Should there be any questions or concerns regarding the present application, the Examiner is invited to contact Applicant's undersigned representative by telephone.

A petition for a two-month extension of time and the appropriate fee have been submitted concurrently herewith.

Respectfully submitted,

ADS
MARCH 12, 2002

Date

Ankur D. Shah
Ankur D. Shah
Registration No. 41,514

FOLEY & LARDNER
Washington Harbour
3000 K Street, N.W., Suite 500
Washington, D.C. 20007-5143
Telephone: (202) 672-5300
Facsimile: (202) 672-5399

SHOULD ADDITIONAL FEES BE NECESSARY IN CONNECTION WITH THE FILING OF THIS PAPER, OR IF A PETITION FOR EXTENSION OF TIME IS REQUIRED FOR TIMELY ACCEPTANCE OF SAME, THE COMMISSIONER IS HEREBY AUTHORIZED TO CHARGE DEPOSIT ACCOUNT NO. 19-0741 FOR ANY SUCH FEES; AND APPLICANT(S) HEREBY PETITION FOR ANY NEEDED EXTENSION OF TIME.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Marked up rewritten claims:

3. (Amended) [The method as claimed in claim 1, further] A method for controlling intake air of an internal combustion engine, the engine having at least one combustion chamber provided with intake means together with an intake manifold provided with a throttle valve, wherein the opening and closure timings of the intake means are adjustable entirely independently from the crankshaft position to control the amount of intake air supplied to the combustion chamber, the method comprising:

providing a response adjustment to variable valve timing control of the intake means for unthrottled intake air control;

separating a first operation range for unthrottled intake air control from a second operation range for throttled intake air control;

varying valve timing of the intake means with the throttle valve held in the neighborhood of the wide open throttle position to perform throttled intake air control during said first operation range; and varying throttle valve position of the throttle valve with valve timing of the intake means held to provide a valve opening duration in the neighborhood of the minimum valve opening duration.

6. (Amended) A system for controlling intake air of an internal combustion engine, the engine having at least one combustion chamber, the system comprising:

at least one intake valve provided for the combustion chamber;

an electromagnetic driver operatively connected to each intake valve for opening said intake valve;

an intake manifold with a throttle valve communicating with each intake valve;
and

sensors providing operation variables indicative of operator torque request command and engine speed;

a control unit receiving said operation variables to determine a first operation parameter indicative of target intake air based on said operator torque request command and said engine speed,

said control unit being operative to make a selection based on said first operation parameter indicative of target intake air between a first operation range for unthrottled intake air control and a second operation range for throttled intake air control, said first and second operation range being separated from each other by a threshold value of target intake air at each of varying values of engine speed, said threshold value increases as engine speed increases,

said control unit being operative to vary, with valve opening timing held in the neighborhood of the top dead center, valve closure timing of said intake valve with said throttle valve held in the neighborhood of the wide open throttle position to perform [throttled] unthrottled intake air control upon selection of said first operation range, and vary throttle valve position of said throttle valve with valve timing of said intake valve held to provide a valve opening duration in the neighborhood of the minimum valve opening duration that is variable with varying engine speed,

said control unit being operative to determine a second operation parameter indicative of a target valve closure timing of said intake valve based on said target intake air,

said control unit being operative to provide a response adjustment to said second operation parameter indicative of said target closure timing to give a processed second operation parameter, and

said control unit being operative to control said electromagnetic driver to cause said intake valve to close at valve closure timing indicated by said processed second operation parameter.